

## **CLAIMS**

### **What is claimed is:**

1. A method comprising:  
receiving a plurality of write transactions from a processor;  
storing data associated with the write transactions to a buffer of an input/output (I/O) hub; and  
flushing the data to an I/O device according to a protocol between the I/O hub and the processor.
2. The method of claim 1, wherein flushing the data to the I/O device includes:  
determining whether a flush signal has been received from the processor; and  
flushing the data if the flush signal has been received, the protocol including an signaling protocol.
3. The method of claim 2, further including sending a write completion signal to the processor for each of the write transactions before the data is flushed to the I/O device, each write completion signal verifying buffering of a corresponding write transaction.
4. The method of claim 3, further including sending a flush completion signal to the processor after the data is flushed to the I/O device.
5. The method of claim 2, wherein flushing the data if the flush signal has been received further includes:  
tagging the buffer with a first source identifier associated with one or more of the write transactions;  
detecting a second source identifier associated with the flushing signal;  
comparing the second source identifier to the first source identifier; and

flushing the data to the I/O device if the second source identifier matches the first source identifier.

6. The method of claim 5, further including repeating the comparing for a plurality of buffers, each buffer corresponding to an I/O port.

7. The method of claim 1, wherein flushing the data to the I/O device includes:

determining whether a latency condition exists; and  
flushing the data if the latency condition exists, the protocol including a timing protocol.

8. The method of claim 7, further including sending a write completion signal to the processor for each of the write transactions as the data is flushed to the I/O device, each write completion signal verifying flushing of a corresponding write transaction.

9. The method of claim 7, wherein the latency condition includes a delay in receiving a next combinable write transaction from the processor and an interface to the I/O device being in an idle state.

10. The method of claim 1, wherein flushing the data to the I/O device includes flushing more than one cache line worth of data to the I/O device.

11. The method of claim 1, wherein the receiving includes receiving a plurality of commands instructing the I/O hub to consider each write transaction for write combining, each of the plurality of write transactions including one of the plurality of commands.

12. An input/output (I/O) hub comprising:  
a buffer; and

a write combining module to receive a plurality of write transactions from a processor, store data associated with the write transactions to the buffer and flush the data to an I/O device according to a protocol between the I/O hub and the processor.

13. The I/O hub of claim 12, wherein the write combining module is to determine whether a flush signal has been received from the processor and flush the data if the flush signal has been received, the protocol to include an signaling protocol.

14. The I/O hub of claim 13, wherein the write combining module is to send a write completion signal to the processor for each of the write transactions before the data is flushed to the I/O device, each write completion signal to verify buffering of a corresponding write transaction.

15. The I/O hub of claim 14, wherein the write combining module is to send a flush completion signal to the processor after the data is flushed to the I/O device.

16. The I/O hub of claim 12, wherein the write combining module is to determine whether a latency condition exists and flush the data if the latency condition exists, the protocol to include a timing protocol.

17. The I/O hub of claim 16, wherein the write combining module is to send a write completion signal to the processor for each of the write transactions as the data is flushed to the I/O device, each write completion signal to verify flushing of a corresponding write transaction.

18. The I/O hub of claim 16, wherein the latency condition includes a delay in receiving a next combinable write transaction from the processor and an interface to the I/O device being in an idle state.

19. The I/O hub of claim 12, further including a plurality of buffers, each buffer corresponding to an I/O port and the write combining module is to store data to and

flush data from the plurality of buffers according to the protocol between the I/O hub and the processor.

20. The I/O hub of claim 12, wherein the data is to be longer than one cache line.

21. A system comprising:  
an input/output (I/O) device;  
a peripheral components interconnect (PCI) express bus coupled to the I/O device;  
a processor; and  
a chipset having an I/O hub coupled to the PCI express bus and the processor, the I/O hub having a buffer and a write combining module to receive a plurality of write transactions from the processor, store data associated with the write transactions to the buffer and flush the data to the I/O device according to a protocol between the chipset and the processor, the data to be longer than one cache line.

22. The system of claim 21, wherein the write combining module is to determine whether a flush signal has been received from the processor and flush the data if the flush signal has been received, the protocol to include a signaling protocol.

23. The system of claim 22, wherein the processor is to generate the flushing signal if a flushing event has occurred and a write combine history indicates that one or more combinable write transactions have been issued by the processor.

24. The system of claim 23, wherein the write combine history is to track combinable write transactions for a particular processor thread.

25. The system of claim 24, wherein the write combine history is to further track combinable write transactions for a particular I/O hub.

26. The system of claim 22, wherein the chipset includes a plurality of I/O hubs, the processor to send the flushing signal to each of the plurality of I/O hubs.

27. The system of claim 26, wherein the processor is to verify that one or more combinable write transactions have been sent to each of the plurality of I/O hubs before sending the flushing signal.

28. The system of claim 21, wherein the write combining module is to determine whether a latency condition exists and flush the data if the latency condition exists, the protocol to include a timing protocol.

29. The system of claim 21, wherein the processor is to instruct the I/O hub to consider each write transaction for write combining based on a page table attribute associated with the write transactions.

30. The system of claim 21, further including a point-to-point network interconnect coupled to the processor and the I/O hub, the network interconnect having a layered communication protocol.

31. A method comprising:

- receiving a plurality of write transactions from a processor, the plurality of write transactions being destined for an input/output (I/O) device;
- storing data associated with the plurality of write transactions to a buffer of the I/O hub;
- determining whether a latency condition exists, the latency condition including a delay in receiving a next combinable write transaction from the processor and an interface to the I/O device being in an idle state;
- flushing the data to the I/O device if the latency condition exists; and
- sending a write completion signal to the processor for each of the plurality of write transactions as the data is flushed to the I/O device, each write completion signal verifying flushing of a corresponding write transaction.

32. The method of claim 31, wherein flushing the data to the I/O device includes flushing more than one cache line worth of data to the I/O device.

33. The method of claim 31, wherein the receiving includes receiving a plurality of commands instructing the I/O hub to consider each write transaction for write combining, each of the plurality of write transactions including one of the plurality of commands.

34. A machine readable medium to store a set of instructions that direct a computer to function in a specified manner when executed, the instructions comprising:  
receiving a plurality of write transactions from a processor;  
storing data associated with the write transactions to a buffer of an input/output (I/O) hub; and  
flushing the data to an I/O device according to a protocol between the I/O hub and the processor.

35. The medium of claim 34, wherein flushing the data to the I/O device is to include:  
determining whether a flush signal has been received from the processor; and  
flushing the data if the flush signal has been received, the protocol to include an signaling protocol.

36. The medium of claim 34, wherein flushing the data to the I/O device is to include:  
determining whether a latency condition exists; and  
flushing the data if the latency condition exists, the protocol to include a timing protocol.